

ville were changed to hurricane at 4 p.m. of the same date.

July 14-19.—On the morning of the 14th a minor disturbance appeared near St. Kitts, West Indies. It moved almost directly westward, passed near Jamaica on the 16th, over the Yucatan Peninsula on the 18th, and finally inland north of Vera Cruz, Mexico, the night of the 19th-20th.

July 21-27.—This disturbance, which also was of minor intensity, was first noted about 200 miles northwest of Progreso, Yucatan, the morning of the 21st. It moved northwestward to the coast of Texas, then inland near Matagorda Bay the night of the 22d-23d, and finally dissipated near Memphis, Tenn., during the 27th.

July 25-August 5.—This disturbance was centered a short distance southeast of the Island of Antigua, West Indies, the morning of the 25th. It passed south of St. Thomas the following night, causing a wind velocity of 60 miles per hour from the northeast. Continuing west-northwestward its center passed north of Puerto Rico on the 26th and almost over Turks Island on the 27th. The lowest barometer reading at Turks Island was 29.37 inches, accompanied by a wind velocity estimated as 85 miles per hour from the northeast. The disturbance moved northwestward during the 27th-28th, then west-northwestward over the northern Bahamas. The center crossed the coast line of Florida a short distance south of Fort Pierce on the 30th, accompanied by a wind at that place of 60 miles per hour from the southeast. However, no great amount of damage resulted as the disturbance moved westward over the Florida Peninsula and passed into the Gulf of Mexico

between Tampa and Fort Myers. Storm warnings were displayed on the east Florida coast from Miami to Titusville and on the west coast from Tarpon Springs to Punta Rassa.

This disturbance continued to move westward but vessel reports on the 1st and 2d indicated a decrease in intensity. From the morning of the 3d until the center passed over the coast line near Brownsville no vessel reports were received near or west of the center, and it was impossible to indicate accurately its position or intensity. However, advices were issued twice daily giving estimates of its position and probable movement until noon of the 3d when storm warnings were ordered for the Texas coast between Freeport and Brownsville. On the evening of the 3d Texas stations were advised that the center probably would reach the south Texas coast between Brownsville and Corpus Christi and be attended by strong shifting winds, possibly reaching gale force near the center with moderately high tides from Port O'Connor southward to Brownsville. The advices on the morning of the 4th were that the center would cross the Texas coast between Corpus Christi and Brownsville, but somewhat nearer Brownsville, and that winds would reach gale force over a very small area but probably would not attain hurricane velocity. The center crossed the coast nearly over but slightly south of Brownsville during the early night of the 5th with greatly increased intensity, the highest velocity being 72 miles at Brownsville. No doubt the increase in intensity began as early as the 4th. Considerable damage was caused in the vicinity of Brownsville and over a strip westward to Monterey, Mexico, owing largely to torrential rains.

THE DALLAS, TEX., TORNADO OF JULY 30, 1933

By GORDON E. DUNN¹

[Weather Bureau, Washington, August 1933]

A tornado struck the Oak Cliff section of Dallas, Tex., about 4:15 p.m., eastern standard time, July 30, 1933. It moved from south-southeast to north-northwest for a distance of about 2 miles, killing 4 persons, injuring about 30, and effecting a property loss estimated at \$500,000, though over part of its path there was little or no damage.

This tornado occurred in connection with a rather severe thunderstorm, but the pressure distribution was decidedly of a nontornadic type. On the 28th and 29th a rain area moved steadily northward from the West Gulf coast, reaching Dallas early on the 30th, but attended by no surface cyclonic circulation. The rainfall ranged from 4 to 6 inches in northern Texas and southern Oklahoma. The 5 a.m. airplane flight at Dallas on the 30th showed a weak lapse rate with rather high temperature to top of flight with a very high relative humidity—100 percent over a considerable portion of the vertical air column—and, of course, high absolute humidity. Twenty four hours later the lapse rate was still about the same, but the relative and absolute humidity had greatly

decreased. The upper-air map was rather blank over this area owing to extensive cloud cover, but on the evening chart Dallas reported the highest wind velocity east of the Rockies, 36 miles per hour from the south-southwest at 8,000 feet and 45 to 47 miles from 3,000 to 6,000 feet. There was some slight evidence of cyclonic circulation aloft.

The accompanying aerial photographs taken of the wreckage of this storm by the Fairchild Aerial Surveys, Inc., of Dallas, and kindly furnished by them for use in this article, present a clear and unusual picture of the trail of a tornado. The serpentine path, rotation, and explosive effects are clearly evident. The direction of rotation is less evident, but Mr. J. A. Riley in his personal inspection of the storm area says, "there appears very strong evidence that the rotation was counterclockwise." Figure 1 shows the area of major destruction beginning shortly beyond the place where the tornado first touched ground. Between the areas covered by figures 1 and 2 there is a vacant lot where for one quarter mile little damage could be done. In figure 2 the serpentine path is clearly shown. The tornado continued on beyond this area for a short distance with little damage.

¹ Based on a report by Mr. J. A. Riley, official in charge, Weather Bureau Airport, Dallas, Tex.